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WADC, Aeronautics Div., Wright-Patterson Air Force Base, O.
(WADC Technical Report 52-50)

Qualification Tests of Weatherhead AN6292 Hydraulic Hose Assemblies -
and Appendixes I and II

Jacobellis, Alfonse A., March '52 18pp tables

Hose
Hydraulic equipment

Hydraulic and Pneumatic Equipment (20)
Distribution Equipment (4)

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QUALIFICATION TESTS OF WEATHERHEAD AN 6292 HYDRAULIC HOSE ASSEMBLIES

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March 1952

E. O. No. S-452-507B

Wright Air Development Center
Air Research and Development Command
United States Air Force
Wright-Patterson Air Force Base, Ohio

FOREWORD

The report was prepared by the Wright Air Development Center, Wright Patterson Air Force Base, Ohio, covering tests of AN6292 high pressure (3000 psi) hydraulic hose assemblies developed by the Weatherhead Company under Contract No. AF33(038)6399, Purchase Order No. (33-038)49-7104E. The tests were begun on 21 November 1950 and completed 29 June 1951. Work on the project, identified by Expenditure Order No. S-452-507B, Qualification Testing of Elastomer Plastic and Fluid Components, was administered under the direction of the Aircraft Laboratory, Aeronautics Division, Wright Air Development Center, with Mr. S. Prete acting as project engineer. This report was prepared by Lt A. A. Jacobellis. Supplements will be added as development of other sizes progresses.

ABSTRACT

The Weatherhead Company hydraulic hose assemblies, Nos. 850-40000, 850-50000, 850-60000, 850-80000 respectively were subjected to qualification tests at Wright Air Development Center to determine conformance with the requirements of Specification MIL-H-5512 dated 3 January 1950 and MIL-H-5017 dated 13 February 1950. The hose assemblies were found to be essentially in accordance with these Specifications and drawing AN6292 dated 27 May 1949 in sizes -4, -5, -6, and -8 and are considered satisfactory for use in aircraft hydraulic systems at operating pressures up to 3000 psi.

PUBLICATION REVIEW

Manuscript copy of this report has been reviewed and found satisfactory for publication.

FOR THE COMMANDING GENERAL:

Randall D. Keeler Jr. Col.
for JACK A. GIBBS
Colonel, USAF
Chief, Aircraft Laboratory
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INTRODUCTION

With the advent of 3000 psi aircraft hydraulic systems it became necessary to obtain hydraulic hose capable of performing satisfactorily at this operating pressure. The various manufacturers have produced double wire braided hose to meet the rigid requirements set forth by the specification covering this hose. Although the manufacturers of the hose have been able to produce qualification samples capable of passing the specification, difficulty is still being encountered in maintaining these qualities in production. Progress has been made in the industry and it is expected that more and better 3000 psi hose will be available in the near future. The hose covered by this report represents the best hose available at the present time.

QUALIFICATION TESTS OF WEATHERHEAD AN6292 HOSE ASSEMBLIES

1. The following hose assemblies were submitted by the Weatherhead Company, Cleveland, Ohio for qualification tests in accordance with Specifications MIL-H-5017 and MIL-H-5512 and Drawing AN6292:

No. of Assy	No. of Hose Assy	Weatherhead Hose No.	Weatherhead Fitting No.	Hose Mfr. & Construction No.	Tube Construction No.	No. of Wire Braids
13	AN6292-4	850-40000	149-28004	B.F.Goodrich LT-HWP-348	54483	1
13	AN6292-5	850-50000	149-28005	B.F.Goodrich MLTW-1444	59572	1
14	AN6292-6	850-60000	149-28006	MLTW-1444	59572	2
12	AN6292-8	850-80000	149-28008	B.F.Goodrich T-55-38-350	59886	2

NOTE: The hose in each case was manufactured with B. F. Goodrich Tire No. 647.

2. The Weatherhead Company submitted the following test reports showing conformance to Specifications MIL-H-5017 and MIL-H-5512.

Date	Size
5 January 1951	-4
5 January 1951	-5
5 July 1951	-6
7 September 1951	-8

In the two reports, dated 5 January 1951, the pressures shown for the -4 and -5 sizes, except for the operating pressure, were lower than those required by the specification. The actual burst strength of the hose was determined by test, and the proof and leakage test pressures were based on 50 and 70 percent respectively of the actual burst pressure.

3. The results of the qualification tests conducted by the WADC on MIL-H-5512 are shown in Appendix I, and the list of drawings submitted are contained in Appendix II of this report. It should be noted that to make a proper assembly the hose cover was first removed and the ends of the hose and the fittings were then mounted. The fittings are of the detachable type.

4. On the basis of qualification tests conducted at the WADC and the data contained in the Weatherhead test reports, the Weatherhead 850-40000, 850-50000, 850-60000, and 850-80000 hose assemblies are essentially in accordance with Specifications MIL-H-5017 and MIL-H-5512, and Drawing AN6292.

5. Inasmuch as Specification MIL-H-5017 is an experimental specification at the present time, the Weatherhead 850-40000, 850-50000, 850-60000, and 850-80000 assemblies have been granted Air Force approval under Specification MIL-H-5512 as AN6292-4, AN6292-5, AN6292-6, and AN6292-8 hose assemblies respectively.

6. The Weatherhead hose assemblies, 850-40000, 850-50000, 850-60000, and 850-80000 respectively, are being recommended for consideration by the Bureau of Aeronautics and the Aeronautical Standards Group for listing in Qualified Products List 5512.

7. It should be noted that in the Weatherhead assembly part number the first two digits indicate the aircraft series and type of hose, and the second two digits indicate the hose size, and the last four digits indicate the hose length to the nearest hundredth of an inch. For example, 850-81750 indicates a 3000 psi hydraulic hose assembly, size -8, 17-1/2 inches long.

APPENDIX I

SPECIFICATION MIL-H-5017 LABORATORY TEST DATA

TABLE I

WEATHERHEAD HOSE ASSEMBLY 850-40000

Specimen No.	Specification, Paragraph No. and Summary of Requirement	Test Results
1 thru 6	<u>Impulse</u> 4.5.3.6 Hose assemblies shall withstand impulse cycling at peak pressures from 0 to 150% of hydraulic operating pressure for 100,000 cycles. There shall be no evidence of leakage, blow-off of fittings or malfunctioning.	Satisfactory
7 and 9	<u>Cold (Oil Filled)</u> 4.5.2.5 After a 24 hour exposure to -65° to -50° temperature, oil filled hoses shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.	Satisfactory
8	<u>Cold (Dry)</u> 4.5.2.5 After a 24 hour exposure to -65° to -50° temperature, no oil in hose, hose shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.	Satisfactory
10 and 11	<u>Burst</u> 4.5.3.2 Hose assembly shall withstand 18,000 psi. The rate of pressure rise shall be 25,000 psi per minute. The hose shall not burst, the end fitting shall not blow off or loosen, and there shall be no leakage.	Satisfactory <small>NOTE: Specimen No. 10 burst at 18,000psi 6 inches from fitting. No. 11 burst at 19,200 psi, 3 inches from fitting. Both hoses contracted 1.1% at 3000 psi during burst test.</small>

TABLE I

WEATHERHEAD HOSE ASSEMBLY 850-40000

Specimen No.	Specification, Paragraph No., and Summary of Requirement	Test Results
1 thru 3	<u>Torque</u> 4.5.3.7 Fittings shall be tightened 1-3/4 times maximum torques listed in Drawing AND10056, then loosened. This is repeated 15 times. There shall be no evidence of failure or deformation of fitting assembly, and swivel nut shall be free enough to permit turning by hand.	Satisfactory
12 and 13	<u>Reduction in Diameter</u> 4.5.2.4 Samples shall be oil-aged and measured at each end. Inside diameter shall not decrease to less than 90% of specified minimum inside diameter.	Satisfactory

TABLE 2
WEATHERHEAD HOSE ASSEMBLY 850-50000

Specimen No.	Specification Paragraph No. and Summary of Requirement	Test Results
1 thru 6	<u>Impulse</u> 4.5.3.6 <p>Hose assemblies shall withstand impulse cycling of peak pressures from 0 to 150% of hydraulic operating pressure for 100,000 cycles. There shall be no evidence of leakage, blow-off of fittings or malfunctioning.</p>	Satisfactory
9 and 11	<u>Cold (Dry)</u> 4.5.2.5 <p>After a 24 hour exposure to -65 to -75°F temperature, no oil in hose, hose shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.</p>	Satisfactory
10	<u>Cold (Oil Filled)</u> 4.5.2.5 <p>After a 24 hour exposure to -65° to -75°F temperature, oil filled hose shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.</p>	Satisfactory
7 and 8	<u>Burst</u> 4.5.3.2 <p>Hose assembly shall withstand 18,000 psi. The rate of pressure rise shall be 25,000 psi per minute. The hose shall not burst, the end fitting shall not blow off or loosen and there shall be no leakage.</p>	Satisfactory N.O.E: No. 10 burst at 18,000 psi 6 inches from fitting. No. 11 burst at 19,200 psi, 3 inches from fitting. Both hoses contracted 1.1% at 3000 psi during burst test.

TABLE 2
WEATHERHEAD HOSE ASSEMBLY 850-50000

Specimen No.	Specification Paragraph No. and Summary of Requirement	Test Results
12 and 13	<u>Coupling</u> 4.5.3.4 Samples subjected to impulse tests shall be checked for bulging of the inner tube.	Satisfactory
1 and 3	<u>Torque</u> 4.5.3.7 Fittings shall be tightened 1-3/4 times maximum torques listed in Drawing AND10056 then loosened. This is repeated 15 times. There shall be no evidence of failure or deformation of fitting assembly, and swivel nut shall be free enough to permit turning by hand.	Satisfactory <small>NOTE: Torque was 210 inche-lbs.</small>
3	<u>Reduction in Diameter</u> 4.5.2.4 Samples shall be oil-aged and measured at each end. Inside diameter shall not decrease to less than 90% of specified minimum inside diameter.	Satisfactory

TABLE 3

WEATHERHEAD HOSE ASSEMBLY 850-60000

Specimen No.	Specification Paragraph No. and Summary of Requirement	Test Results
1 thru 6	<p style="text-align: center;"><u>Impulse</u></p> <p>4.5.3.6 Hose assemblies shall withstand impulse cycling at peak pressures from 0 to 150% of hydraulic operating pressure for 100,000 cycles. There shall be no evidence of leakage, blow-off or fittings, or malfunctioning.</p>	Satisfactory
7 and 9	<p style="text-align: center;"><u>Cold (Dry)</u></p> <p>4.5.2.5 After a 24 hour exposure to -65°F temperature, no oil in hose, hose shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.</p>	Satisfactory
6	<p style="text-align: center;"><u>Cold (Oil Filled)</u></p> <p>4.5.2.5 After a 24 hour exposure -65°F temperature, oil filled hoses shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.</p>	Satisfactory
10 and 11	<p style="text-align: center;"><u>Burst</u></p> <p>4.5.3.2 Hose assembly shall withstand 18,000 psi. The rate of pressure rise shall be 25,000 psi per minute. The hose shall not burst, the end fitting shall not blow off or loosen and there shall be no leakage.</p>	Acceptable NOTE: No. 10 hose leaked at 16,800psi at base of one socket. No. 11 hose leak- ed at 15,400 psi at base of one socket. No. 10 hose contracted 2.62% and No. 11 contracted 2.26% at 3000 psi during burst test.
12 thru 14	<p style="text-align: center;"><u>Torque</u></p> <p>4.5.3.7 Fittings shall be tightened 1-3/4 times maximum torques listed in drawing AND10056 then loosened. This is repeated 15 times. There shall be no evidence of failure or deformation of fitting assembly, and swivel nut shall be free enough to permit turning by hand.</p>	Satisfactory

TABLE 4
WEATHERHEAD HOSE ASSEMBLY 850-80000

Specimen No.	Specification Paragraph No. and Summary of Requirement	Test Results
1 thru 6	<u>Impulse</u> 4.5.3.6 Hose assemblies shall withstand impulse cycling at peak pressures from 0 to 150% of hydraulic operating pressure for 100,000 cycles. There shall be no evidence of leakage, blow-off of fittings or malfunctioning.	Satisfactory
9 and 10	<u>Burst</u> 4.5.3.2 Hose assembly shall withstand 18,000 psi. The rate of pressure rise shall be 25,000 psi per minute. The hose shall not burst, the end fitting shall not blow off or loosen, and there shall be no leakage.	Satisfactory <small>NOTE: No.9 hose burst at 17,600psi 7 inches from fitting No.10 hose burst at 18,500 psi 6 inches from fitting. No.9 hose contracted .96% at 3000 psi while No.10 hose contracted .63% at 3000 psi.</small>
1 thru 3	<u>Torque</u> 4.5.3.7 Fittings shall be tightened 1-3/4 times maximum torques listed in Drawing AND1005E then loosened. This is repeated 15 times. There shall be no evidence of failure or deformation of fitting assembly, and swivel nut shall be free enough to permit turning by hand.	Satisfactory
11 and 12	<u>Reduction in Diameter</u> 4.5.2.4 Samples shall be oil-aged and measured at each end. Inside diameter shall not decrease to less than 90% of specified minimum inside diameter.	Satisfactory
7	<u>Cold (Oil Filled)</u> 4.5.2.5 After a 24 hour exposure at -65°F temperature, oil filled hoses shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.	Satisfactory

TABLE 4

WEATHERHEAD HOSE ASSEMBLY 850-80000

Specimen No.	Specification Paragraph No. and Summary of Requirement	Test Results
8	<p style="text-align: center;"><u>Cold (Dry)</u></p> <p>4.5.2.5</p> <p>After a 24 hour exposure to -65°F temperature, no oil in hose, hose shall be capable of bending 180°. After removal from cold room, there shall be no evidence of leakage.</p>	Satisfactory

APPENDIX II

LIST OF WEATHERHEAD DRAWINGS

<u>Drawing No.</u>	<u>Title</u>
	-4 Size
149-28004	Hose End Assembly; Reusable 1/4 AN Swivel to 3/16 H-5017
149-28104	Body; 3/16 H-5017 Hose
149-28204	Insert; 3/16 I.D. 5017 Hose
	-5 Size
149-28005	Hose End Assembly; Reusable 5/16 AN Swivel to 1/4 H-5017
149-28105	Q. A. Body - 1/4 H-5017 Hose
149-28205	No. 5 Hose End Insert (1/4 H-5017 Hose)
	-6 Size
149-28006	Hose End Assembly; Reusable 3/8 AN Swivel to 5/16 H-5017 Hose
149-28106	Body - 5/16 H-5017 Hose
149-28206	Insert; 5/16 H-5017 Hose
	-8 Size
149-28008	Hose End Assembly; Reusable 1/2 AN to 7/16 H-210 Hose
149-28108	Body; 7/16 H-210 Hose
149-28208	Insert; 7/16 H-210 Hose